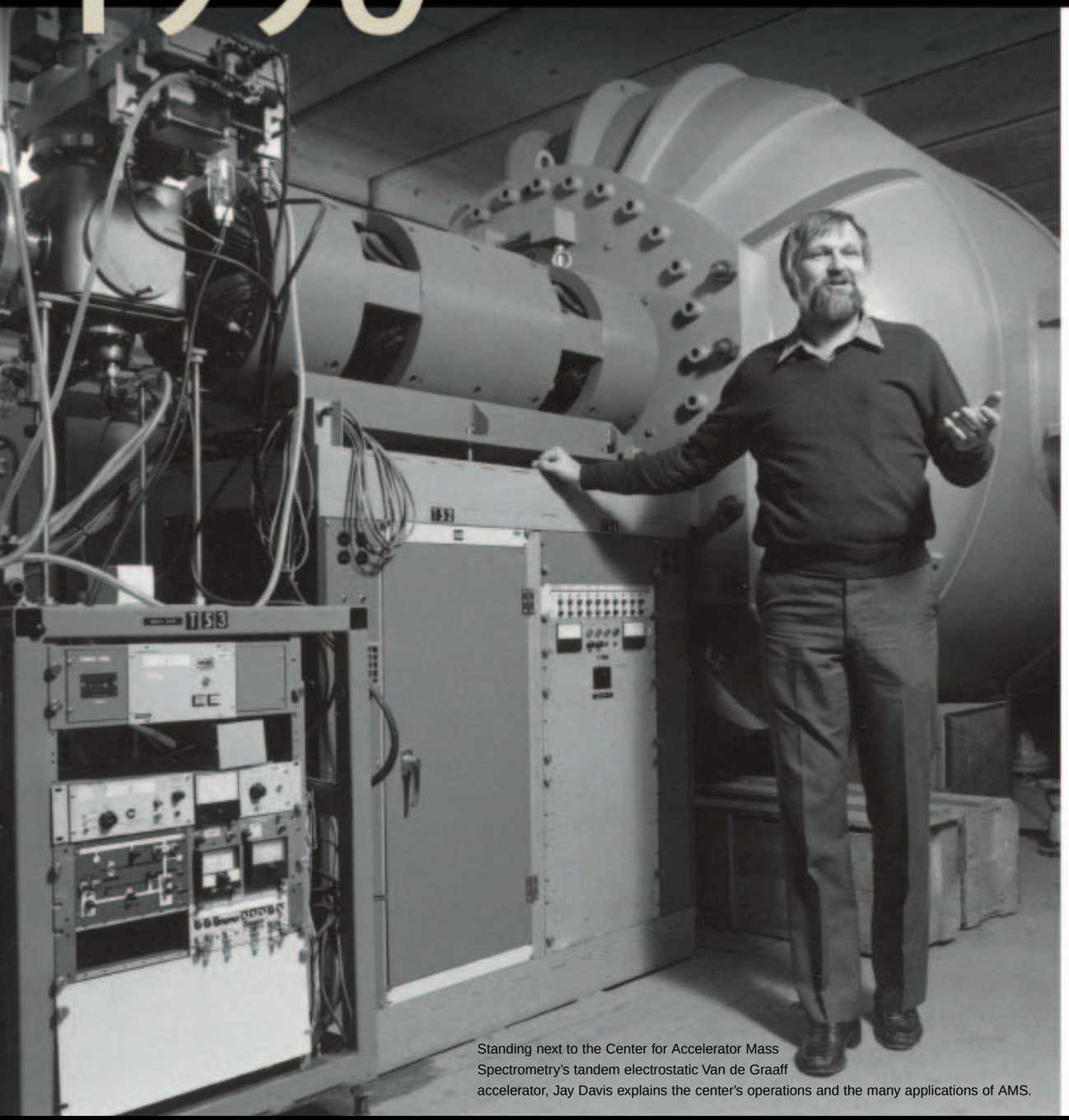


Standing next to the Center for Accelerator Mass Spectrometry's tandem electrostatic Van de Graaff accelerator, Jay Davis explains the center's operations and the many applications of AMS.

Detecting One in a Quadrillion

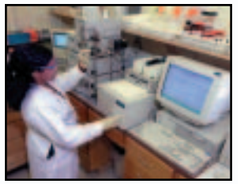
In 1990, soon after the Center for Accelerator Mass Spectrometry (CAMS) started operations, the first biomedical experiment using AMS was performed at Livermore. It measured the effects on rat DNA of a suspected carcinogen that results from cooking meat. From the beginning, CAMS was proving to be a highly versatile research facility, contributing to the success of a wide range of Laboratory programs and the research projects of many external users.

AMS is a sensitive technique for measuring concentrations of specific isotopes in very small samples—able to seek out, for example, one carbon-14 isotope out of a quadrillion (million billion) other carbon atoms. The technique enables Laboratory researchers to diagnose the fission products of atomic tests and monitor the spread of nuclear weapons to other countries by detecting radioisotopes in air, water, and soil samples. In addition, AMS supports studies in environmental quality, climate change, seismology, archaeology, biomedical science, and many other areas of scientific research.

The need for a multiuser AMS capability was recognized by Jay Davis, who at the time was a division leader, and he "sold shares" in the new accelerator facility to programs throughout the Laboratory, promising to get the facility built if they would help pay to run it. Additional support came in the form of one of Livermore's first large-scale initiatives in its Laboratory Directed Research and Development program. Davis also sold the idea to The Regents of the University of California (UC), winning funding from them in January 1987 to help support construction and continuing use of CAMS by UC faculty. To help lower costs, the designers used as many spare components as they could find. The accelerator came from the University of Washington, and a couple of the largest magnets had previous lives in an electron beam accelerator at Stanford University.

Established in 1988, CAMS was unique from the start because of the use of high-quality beam optics and a computer-control system that allows large numbers of high-precision measurements to be taken. The capabilities exceeded those of other AMS facilities because of the particularly demanding needs of the Laboratory's programs. An initial optimistic projection was that CAMS could someday handle 5,000 to 10,000 measurements in a year. Today, CAMS analyzes some 30,000 research samples annually—accounting for approximately one quarter of the worldwide AMS analyses performed per year. The center's scientists are participants in approximately 70 collaborative research projects with universities worldwide.

CAMS recently added a much smaller spectrometer that is dedicated to analyses of carbon-14 for biomedical and environmental research. In addition, the center operates a nuclear microprobe that has been used to develop pioneering applications in bioscience and environmental research. Since 1999, CAMS has been designated by the National Institutes of Health (NIH) as a National Research Resource for biomedical applications of AMS. It is midway through a five-year NIH grant that makes CAMS available to biomedical researchers around the world.



CAMS began operation in 1989 and now processes nearly 30,000 samples per year for its users (above). A recent addition to AMS capability at the Laboratory is a smaller spectrometer (not shown) dedicated to biomedical analyses.